1990 Accomplishments for Research, Extension, and Higher Education

A Report to the Secretary of Agriculture and the Nation

United States
Department of
Agriculture

Joint Council on
Food & Agricultural
Sciences

July 1992

ABOUT THE JOINT COUNCIL

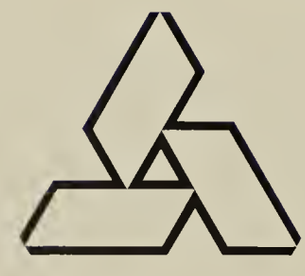
Congress has directed the Joint Council on Food and Agricultural Sciences to improve the planning and coordinating of research, extension, and higher education programs in the public and private sectors and to relate the Federal budgeting process to the overall functioning of the food and agricultural science and education systems (1977, 1981, 1985, and 1990 Farm Bills). Membership of the Joint Council represents both the public and private sectors and includes producers, the food and agribusiness industries, State and Federal agencies, and land-grant and State universities.

The Joint Council prepares three regular reports that provide direction to the food and agricultural science system. The "Five-Year Plan for the Food and Agricultural Sciences" reflects the issues and challenges that the food, fiber, and agricultural science and education system faces within the U.S. Department of Agriculture and its cooperating institutions.

The Council's report on "Priorities for Research, Extension, and Higher Education" outlines the current national emphases in the food and agricultural sciences on a fiscal year basis. This annual report is linked conceptually to the five-year plan.

The annual "Accomplishments for Research, Extension, and Higher Education" provides representative examples of achievements in the food and agricultural science and education system. These achievements reflect the Council's coordination and planning efforts as presented in the five-year plan and priorities report.

These three reports constitute an overall strategic planning and review process. This process facilitates and enhances the coordination, planning, and financial relationships through which short-term and longer term future needs are defined, goals and objectives are established, and accomplishments are noted. The reports provide the foundation for planning an efficient and effective means for meeting the future national and international demands for food, fiber, and forest products.



The Joint Council symbol represents the Council's primary responsibility: to improve coordination and planning among research, extension, and higher education programs. It also characterizes the cooperative spirit that exists among the Federal, State, and private organizations and institutions within the food and agricultural science and education system.

Preface

The National Agricultural Research, Extension, and Teaching Policy Act of 1977, as amended, directed that the Joint Council's annual reports to the Secretary on priorities for research, extension, and higher education should include not only priorities for future action, but also information about "the progress made toward accomplishing the priorities . . . recommended in the annual report issued in the prior year."

The Joint Council develops its priorities two calendar years ahead of each fiscal year in order to provide input to the development of budget requests by USDA's Science and Education agencies and by the Division of Agriculture of the National Association of State Universities and Land-Grant Colleges (NASULGC). For this reason, the accomplishments relating to the priorities of the year just past can be more effectively presented as part of a separate accomplishments report.

Beginning with this report, the Council will tie accomplishments to those previously established fiscal year priorities having significant effect in the current calendar year — a change that should not only provide Congress with the requested type of information, but also result in a more accurate assessment of how well the system is addressing its priorities.

This report, *1990 Accomplishments for Research, Extension, and Higher Education,* presents significant accomplishments of the food and agricultural science and education system as they relate to the priorities identified by the Joint Council in its fiscal year 1989 priorities report:

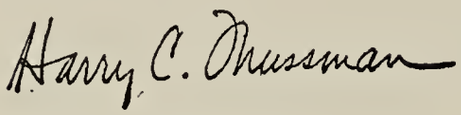
1. Maintain and preserve water quality
2. Expand biotechnology and its applications
3. Develop and maintain scientific knowledge and expertise
4. Improve understanding of food, diet, human nutrition, and health relationships
5. Sustain soil productivity
6. Assess new and expanded uses for agricultural products
7. Preserve germplasm and genetically improve plants
8. Improve food processing, quality, distribution, and safety

Because 1990 marks 100 years of service for the land-grant institutions established by the Second Morrill Act, we have chosen to begin this report with an examination of what these institutions have accomplished during the past century to benefit not only African-Americans and other minorities, but the entire Nation.

The next section provides an in-depth look at some important research, extension, and teaching accomplishments supporting many of the Joint Council's priorities. Many hours of personal interviews with lead scientists, extension specialists, and educators went into developing these articles. Accomplishments relating to priority topics not covered in this section appear among the "Accomplishments in Brief" section at the end of the report.

We hope to have captured your interest with the topics covered in this report. We encourage you to contact the scientists named in connection with each item if you have an interest in learning more about their work.

Sincerely,



HARRY C. MUSSMAN
Cochair

H. ROUSE CAFFEY
Cochair

Contents

1890 LAND-GRANT COLLEGES AND UNIVERSITIES • CENTENNIAL CELEBRATION •

100 Years of Service

1890 1990

The Second Morrill Act

A Centennial Review of the Land-Grant University System's Service to African-Americans

One hundred years ago, Congress passed the Second Morrill Act, which laid the foundation for public institutions of higher learning dedicated to the advancement of African-Americans. This event, a milestone in American history, brought the nation toward full realization of Justin Smith Morrill's great ideal: equal access to higher education for all Americans. Education for the common man, the hallmark of the land-grant universities, took on new form and substance.

On the occasion of the centennial of the enactment of the Second Morrill Act, the Joint Council on Food and Agricultural Sciences finds it appropriate to make special recognition of the legacy of the 1890 institutions in realizing Morrill's expectations for educating African-Americans and other minorities. America is richer for the contributions of George Washington Carver, Booker T. Washington, and Thomas Campbell, who, among others, are noteworthy examples of the 1890 institutions' practical application of science to the wants and welfare of man.

Originally founded, in many instances, as teacher training institutions, the 1890 land-grant colleges and universities rapidly expanded their curricula into the areas of agriculture, mechanical arts, and home economics. In 1897, the Alabama Legislature founded the Tuskegee State Experiment Station with an annual appropriation for research. Thus, the first public funding for research at 1890 institutions came into existence. Today, 17 institutions in 16 States conduct approximately $25 million worth of federally funded research each year.

Current enrollment is more than 70,000 students. With the exception of the University of Arkansas-Pine Bluff, all of the 1890 institutions offer graduate degrees.

Dr. Willie L. Willis, of North Carolina A & T University, searches for ways to reduce the incidence of campylobacter and other harmful germs found in poultry.

Federal legislation has played a vital role in enhancing the capabilities of the 1890 institutions. The Council of Presidents of 1890 Land-Grant Colleges and Universities worked diligently for half a century to ensure permanent funding and autonomy over their agricultural research and cooperative extension programs. In 1965, Public Law 89-106 was passed giving USDA the authority to fund research at the 1890 and other eligible institutions. In 1977, exclusive control over and permanent funding for research and cooperative extension programs was secured by the 1890 institutions with the passage of Sections 1444 and 1445 of the Food and Agriculture Act. Under Public Law 97-98, Section 1433, $50 million was authorized in 1982 for upgrading and expanding research facilities at the 1890 institutions and Tuskegee. These funds were allocated over a five-year period at approximately $10 million per year divided among the institutions. With a congressionally mandated $10 million research facilities program in 1983, this partnership helped improve facilities and equipment at the universities. As a result, new research programs that attract highly specialized researchers in plant biotechnology, environmental quality, food science, post-harvest technology, aquaculture, and other areas have been established.

In recent years, through the efforts of USDA, the 1890 institutions have received support for teaching programs in agriculture through the Strengthening Grants program. In fiscal year 1990, USDA initiated a the 1890 Institution Capacity Building Grants Program, which was designed to improve institutional teaching and advanced research capabilities. The research component of this program, funded at $3.6 million, addresses high-priority research initiatives in areas where there are present or anticipated needs for increased capabilities and in which it is feasible for applicants to become Centers of Excellence. This program will be administered through competitive grants ranging from $50,000 to $350,000 each.

Today, scientists at 1890 institutions engage in research in many diverse areas, and extension agents provide instruction to their clientele in the four broad national program areas of agriculture and natural resources, home economics, community resource development, and 4-H. Additionally, the 1890 land-grant colleges and universities have expanded their mission of service to help improve the quality of life in less developed countries. They participate in USDA and Agency for International Development (AID) assistance projects, and they train students from many nations and backgrounds.

Professor George Owens with a gardening class at Virginia State University in 1915.

Land-Grant college and university graduates have left a legacy for black youth all over the Nation and the world. These institutions continue to be the primary source of minority undergraduate students in agriculture and home economics.

Graduates from 1890 institutions have, in significant numbers, gone on to complete graduate and professional degrees from major U.S. and international institutions. They are recognized as leaders in their chosen fields — agriculture, home economics, education, research, business, law, medicine, engineering, and sociology, among others. These graduates return their children to their respective alma maters in large numbers, providing a hope for the future articulated by Dr. Booker T. Washington, founder of Tuskegee University. "The individual who can do something that the world wants will, in the end, make his way regardless of race," he said. The 1890 institutions have been and will continue to be a source of empowerment for generations of students making their way toward lifetimes of service and achievement.

Education Reaches Remotest America ... Via 18-Wheeler

It has long been a tradition of American business to travel far and wide to reach a customer. Before urbanization, rural areas represented a larger consumer base than cities did. The need to reach these customers, more often than not isolated from mainstream urban life, created a number of industries. The house-to-house rounds of the now-legendary Fuller Brush man represent one of the familiar, and successful, ways in which business grew to meet demand in rural America.

Academia today is acutely aware of the need to recognize and adapt to the forces reshaping the demand for higher education. The shrinking economy, resources, and population in rural America have caused an urbanization of services ranging from post offices to schools. As a result, many communities are almost as isolated as they were half a century ago. Changing student demographics, too, have caused considerable discussion on how colleges and universities should deliver their products. Traditional high school graduates going immediately on to a 4-year degree program are a declining percentage of total enrollments. Taking their place are growing numbers of part-time students — those working full- time and taking courses at night, for example, or young parents returning to school to acquire new skills.

For these people, particularly if they live in rural areas, traveling great distances to receive campus-based daytime instruction is difficult, if not impossible. Fiscal constraints, low campus enrollments, and shortages of faculty have forced some universities to eliminate courses and majors, further reducing educational opportunities.

In central Georgia, the idea of the Fuller Brush man has been brought back to life. Only this time, education, not housewares, is being marketed. For several years a "classroom on wheels" has been making the rounds in 11 mid-Georgia counties. Even without its wheels, this 45-foot semi-trailer with air-ride suspension would be no ordinary classroom. It's equipped with six computer systems,

---

Fort Valley State College's "Mobile Teaching Laboratory for Adult Educators" provides sophisticated technology to educators in communities unable to support their own modern education programs.

video equipment, satellite downlink, and audio equipment. The equipment on board enables users to get hands-on experience with interactive video, laser videodiscs, CD-ROM, videocassettes, video graphics, desktop publishing, and on-line databases.

The Mobile Teaching Laboratory for Adult Educators is the product of a grant provided to the State of Georgia, the University of Georgia, and Fort Valley State College to adopt a statewide approach to adult education. With funds from the W.K. Kellogg Foundation and USDA's Office of Higher Education Programs, the three began a six-year initiative to help adults in the State's poorer, more isolated areas prepare for the demands of an ever-changing workplace.

As part of the initiative, the Fort Valley State College Cooperative Extension Program was responsible for designing a "new educational delivery system," targeted for community-based adult educators. The subject matter of the program was equally targeted — technology for education and the workplace. The adult educators were seen as potential multipliers of technical knowledge to rural residents needing computer- based learning and job skills. The program's main mission was to provide sophisticated technology to communities unable to support their own modern education programs.

To fulfill this mission, Extension administrators and faculty immediately identified the need for a technology learning laboratory. The lab would make available a variety of systems on which educators could experiment, learn, and gain hands-on experience. "We want our unit to promote an awareness of what can be used as a teaching tool," says Fort Valley State College Extension Specialist Mercedes Parker. "This includes all the technologies that can bring a community information, no matter how isolated it is."

Once the idea of the lab was adapted, the problem became locating it in an area equally accessible to potential users throughout the program's service area. The answer was simple — take the facilities to the people. To do that, the Georgia Extension Service leased a semi-trailer from the Tennessee Valley Authority and converted it into a high-tech rolling laboratory.

In January 1988 the lab began its 11-county tour with a fanfare of publicity by the extension offices of the counties it was to serve. Consequently, the big red, white, and blue unit was well received when it pulled into small towns, rolled out its awnings, and set up shop. The unit was seldom empty and had averaged 93 scheduled appointments per county when the grant support expired in December 1989. Typical participants included local health care providers, county extension agents, librarians, social workers, and other community adult educators.

A typical community visit of four weeks began with an orientation session during which the trainees developed a schedule of individualized instruction and learning goals for technologies or systems they were interested in.

"While visitors look everything over," Parker explains, "the computers and their programs attract the most attention." Those who want to learn computer basics "hands-on" can work with an interactive video or Apple II-GS program.

"Our graphics system teaches a user how to draw with a computer," she adds. "It shows how to create charts, landscapes, drawings, and graphs." The word-processing program teaches students to use a computer to prepare and edit manuscripts, letters, memos, and forms. The Desktop Publisher teaches how to design and lay out newsletters, bulletins, brochures, posters, flyers, and newspapers. For as many miles as the Mobile Teaching Laboratory has traveled, there seem to be an equal number of ideas on how to expand its use.

The word processing program teaches students to use a computer to prepare and edit manuscripts, letters, memos, and forms. The Desktop Publisher teaches how to design and lay out newsletters, bulletins, brochures, posters, flyers, and newspapers. For as many miles as the Mobile Teaching Laboratory has traveled, there seem to be an equal number of ideas on how to expand its use. The mobile teaching concept has been adapted in Kentucky, where Dr. Terry Magel, of Kentucky State University, has received a USDA Capacity Building grant to use a mobile unit to promote computer literacy in six rural Kentucky counties.

The mobile teaching concept has been adapted in Kentucky, where Dr. Terry Magel, of Kentucky State University, has received a USDA Capacity Building grant to use a mobile unit to promote computer literacy in six rural Kentucky counties. Dr. Magel's Introduction to Computers course provides students with a working knowledge of spreadsheet, word processing, and database computer applications, as well as a familiarity with disk operating systems. The course is taught by adjunct faculty from the university and confers three hours of academic credit toward an associate or bachelor's degree.

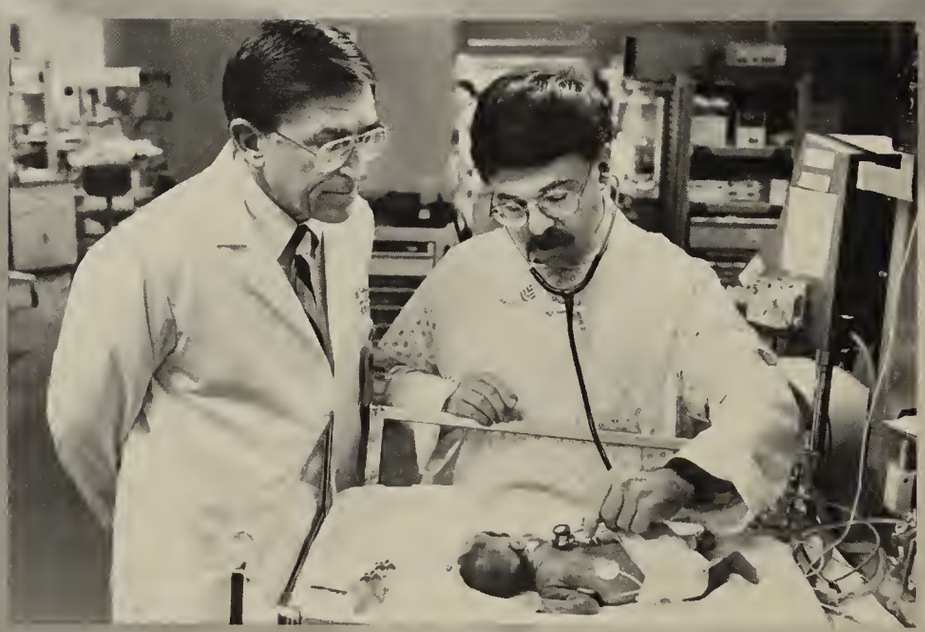
"We intend to use the unit as a recruiting mechanism as well," Dr. Magel says. "Hopefully, students' experience with the mobile unit will draw them into associate degree programs at the community colleges affiliated with Kentucky State," he adds. Five more advanced computer courses are planned for delivery using the mobile unit.

Additionally, Pennsylvania State University's Nutrition Center operates the "Nutrition-Van-Go," a mobile resource preview center that conducts nutrition workshops and provides teaching resources to health and related professionals in the State's outlying areas. Mobile teaching units are also operated by Alabama's Tuskegee University, Missouri's Lincoln University, the University of Arizona, and the New Jersey Nutrition Education and Training Program.

For more information contact:

Dr. Terry Magel
Professor of Computer Science
Department of Computer Science
Kentucky State University
Frankfort, KY 40601
(502) 227-6384

Dr. Fred Harrison
Director, Cooperative Extension
School of Agriculture
Fort Valley State College
Fort Valley, GA 31030
(912) 825-6297



Stable Isotopes Add Precision to Nutritional Science

If a baby is born underweight, chances are its birth was premature or the baby was malnourished or undernourished while in its mother's womb. Their fragile condition at the time of delivery makes low birthweight (LBW) babies vulnerable to a host of disorders in their first weeks of life. A relatively high incidence of underweight births in the United States is one reason this country has a higher rate of infant mortality than most other industrialized nations. While proper infant nutrition is essential for the healthy growth of normal babies, the nutritional needs of LBW babies have assumed a whole new importance.

Dealing with the unique nutritional requirements of normal and LBW babies has long been the specialty of the Children's Nutrition Research Center (CNRC). CNRC is funded by USDA's Agricultural Research Service and is located at Houston's Baylor College of Medicine.

In 1983, CNRC researchers were the first to document that infants as young as one month old can digest cereal, although absorption of nutrients contained in the cereal may not be complete. A year later, CNRC was first to show that breast-fed infants require less dietary energy and protein than established nutrient allowances for formula-fed infants.

Opposite page: Dr. Ken Ellis is working to establish body composition standards by evaluating the lean body and fat mass of more than 700 children. Here, he works with an infant in the 40k Counter. The 40K is used to measure potassium, a mineral found in the body that is essential to growth. Body composition guidelines could help healthcare professionals customize diets and treatments for a wide range of health and development problems.

Inset, Opposite page: Dr. Buford Nichols, director of the Children's Nutrition Research Center, is pictured with Dr. Richard Schanler, who specializes in designing feeding strategies that will help low birth-weight babies "catch up" with the growth and development of their peers.

Nurse Betty Walker, left, assists Dr. Kathleen Motil with a Total Body Electrical Conductance (TOBEC) scan. Radio waves generated by TOBEC pass through a magnetic field and bounce off the individual in relation to the amount of lean body mass and fat mass.

Today, CNRC scientists are performing some of the Nation's first non-invasive experiments on human subjects to better understand not only the physiology of infant nutrition, but that of teenagers and pregnant women as well. Using stable isotopes of several chemical elements as "markers," CNRC scientists have been able to precisely determine, among other things, how an individual uses nutrients derived from food, how a lactating woman processes fat from the diet, and how nutrition regulates the body's protein turnover. By using stable isotopes to "uniformly label" food sources, CNRC scientists have improved on "guess work" methodologies, such as balance studies, that could only approximate nutrient needs, expenditure, and turnover in humans.

Stable isotopes are important in nutrition research because they can be added to food sources as "labels" for tracking the body's breakdown and use of specific nutrients. It is the unique structure of stable isotopes that makes them well-suited for this purpose. Almost every element exists in two or more atomic forms, or isotopes. Isotopes are either radioactive, and thus not suitable for research using normal human subjects, or nonradioactive.

Carbon, for instance, exists in a form containing 6 protons and 6 neutrons (C-12), and in a heavier form, containing 6 protons and 7 neutrons (C-13). In nature, the isotope C-13 represents only 1 percent of all carbon atoms and is nonradioactive, providing the best means of tracking the fate of proteins, lipids, carbohydrates, and vitamins in the body. C-13 atoms are easily distinguished from the more abundant C-12 atoms. When used to label food sources, they enable scientists to track the atoms of nutrients derived from food as they are assimilated into the body.

While the use of stable isotopes in nutrition research is not new, it has been extremely expensive. Traditionally, high levels of stable isotopes were needed in order to be detected in body fluids and tissues by existing technology. Limited supplies restricted the extent to which stable isotopes could be used in research.

Now, with the availability of new, more sensitive mass spectrometry — the technology used to track the fate of stable isotopes — lower levels of isotopes can be used as "markers", less expensively and just as effectively as larger quantities had been.

This has been the case with CNRC's studies of protein production in the liver. By intravenously administering to their subjects the amino acid lysine, labeled with heavy isotopes of hydrogen, researchers were able to reduce from 16 days to 4 hours the amount of time needed to measure protein turnover in the liver. Considering the staff and lab time involved in these studies, considerable cost savings can be realized in future research activities.

The source and use of lactoferrin in pre-term infants is another example of how CNRC is using stable isotopes in nutrition research. Lactoferrin, a protein present in milk, is known to be iron-binding. As such, it prevents the growth of microbial organisms in the body. A recent study of lactoferrin metabolism in pre-term infants revealed that they absorb lactoferrin molecules found in milk. Additionally, analysis of lactoferrin found in the subjects' urine revealed that infants do not synthesize, or produce by themselves, any lactoferrin molecules. Infants instead must derive all of the substance from milk consumption.

Using a similar methodology, CNRC researcher Kathleen Motil was able to determine that the current recommended daily allowance (RDA) of 1.0 grams of protein per kilogram of body weight for lactating women is inadequate. By intravenously administering the amino acid leucine, a component of protein, labeled with heavy isotopes of carbon, researchers were able to monitor blood plasma to assess leucine turnover and degradation from body protein and to analyze breath for the degree of leucine oxidation. The results showed that lactation alters a woman's protein metabolism.

"It [lactation] imposes a significant nutritional and metabolic cost to the mother in excess of the needs for milk production alone," Dr. Motil says. She recommends that the current protein RDA for pregnant women be reconsidered "because lactating women need greater amounts of protein than previously thought to support breast milk secretion, as well as to sustain their bodies' protein metabolism."

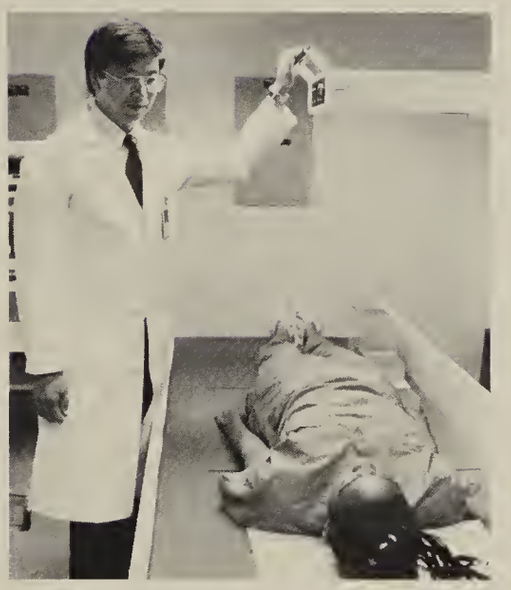
"Ultimately," adds CNRC's director, Dr. Buford Nichols, "we will know the absolute, qualifiable production of proteins critical for life."

Another aspect of CNRC's stable isotope research has been to determine how the body uses dietary fat. In one study, researchers were able to determine that the greater the volume of body fat, the less the individual oxidizes dietary fat.

Following the oral administration of the carbon-labeled fat triolein, researchers simultaneously measured a subject's breath for labeled carbon dioxide to determine the amount of fat metabolized for energy, and sampled breast milk to see how much dietary fat was secreted as milk fat. The amount of labeled dietary fat (triolein) that remained unaccounted for could safely be assumed to be stored as body fat. Researchers found that the leaner the body mass of the subject, the greater the percentage of 13-C triolein oxidized, or burned, by the body. Conversely, the larger the amount of fatty tissue in the body, the greater the percentage of 13-C triolein the body stored.

Stable isotopes have also enabled CNRC scientists to conduct in a single study what before had involved several subjects and had been limited to one metabolic process. Using stable isotopes of oxygen (18-O) to label body water in pre-term infants, researchers have been able to obtain simultaneous and precise measurements of the energy intake, expenditure, and storage of human subjects without confining them in the calorimetry chambers traditionally used in such studies. The "free-living" subjects used in stable isotope experimentation "provide a more accurate picture of how infants are burning calories," says Dr. Nichols. "Our results are no longer predetermined in some respects by our methodology," he explains. By combining energy expenditure and body composition measurement in one study, he adds, science can now more accurately gauge

Dr. William Wong uses a Dual Energy X-Ray Absorptiometry (DEXA) to measure bone mineral content in a study that examines the nutritient requirements of teenage girls. Wong believes findings from the CNRC study could help fine-tune future dietary recommendations for teenage girls.



the energy "cost of growth" that accompanies changes in body composition. The increasing prevalence of teenage pregnancy and obesity in the United States has increased the need to define the energy requirements of pregnant and lactating adolescents. But defining those requirements first demands better information on the food requirements of normal teenagers. Consequently, the CNRC's future research using stable isotopes will extend beyond infants and focus increasingly on understanding the energy requirements of women and teenagers.

"If we hope to improve infant survivability in this country," Dr. Nichols maintains, "then it makes sense to understand and improve the nutrition and health of an at-risk population like teenage mothers."

For more information contact:

Dr. Jacqueline Dupont
National Program Leader,
Human Nutrition
Agricultural Research
Service/USDA
Rm. 132, Bldg. 005 BARC-W
Beltsville, MD 20705
(301) 344-3216

Dr. Buford L. Nichols
Director,
Children's Nutrition Research Center
1100 Bates Street
Houston, TX 77030
(713) 798-7000

What Happens to Food in the Body? Stable Isotopes Provide Better Answers.

How does a body "use" food? How can we determine the essentiality of nutrients in the normal diet? Stable isotopes provide the answer. A revolutionary new approach has been developed at the ARS Children's Nutrition Research Center at Houston's Baylor College of Medicine.

In a recent study, special algae uniformly labeled with heavy carbon were added to the feed of a chicken. CNRC scientists monitored the chicken's digestion and metabolism to determine what nutrients from the algae the chicken used and how it used them. After a series of chemical isolations of these nutrients, researchers were able to develop a profile of the precise nutrient needs of the chicken and plan its diet accordingly. This new research principle, established in chickens, is now being used in investigation of normal human nutrient requirements.

You may be thinking that somewhere in this short food chain lies a key to understanding the exact food requirements of an individual. You are right! It starts with the algae called spirulina, contained in the chicken's feed. Nutrients from the feed, which were uniformly labeled with isotopes contained in the spirulina, were chemically isolated after being consumed by the chicken. Experts had long believed that one of those nutrients, the amino acid proline, was nonessential — that it could be made by the chickens themselves. When the labeled proline was isolated in CNRC's experimental hen, however, the researchers found that most of the proline in the hen's tissues and egg whites contained all 13- C atoms. This meant that the proline had come straight from the feed rather than being broken down and reassembled in the hen's liver, says Dr. Heiner Berthold, who recently conducted this experiment at CNRC's Stable Isotope Research Laboratory. So, contrary to popular belief, proline appears to be among the "essential" nutrients that the body cannot produce.

This process also allows scientists to observe how the body converts these "essential" molecules into energy and into functioning muscle, fat, bone, brain, etc. "Using a uniformly labeled food source is like attaching a microscopic video camera to each nutrient and following its travels through the body," Dr. Berthold maintains. "You see things you had no idea were occurring."

Dr. Heiner Berthold, researcher at the Children's Nutrition Research Center in Houston, spent two years studying nutrient absorption in chickens. The diet fed the hens Dr. Berthold studied contained spirulina alga uniformly labeled with Carbon 13. Dr. Berthold and his colleagues at CNRC proved that a uniformly labeled food source can be a powerful scientific tool in determining the essentiality of amino acids.

The CNRC work has major ramifications for nutritional science in the United States and throughout the world. According to Dr. Jacqueline Dupont, National Program Leader for Human Nutrition at USDA's Agricultural Research Service (ARS), this discovery may pinpoint which amino acids need to be supplied during periods of an infant's development and growth.

Dr. Dupont also says that the process may help researchers to better understand those constituents of breast milk that are the most important to infant growth and development. Knowing this may one day make it possible to develop more sophisticated infant formula products that meet the precise needs of infants during the first few months of life.

"Without a doubt," Dr. Dupont says, "this is the greatest breakthrough in studying the essentiality of nutrients since amino acids were first isolated."

...ous After Surviving Latin Pu...

The company is an example of how exporters who su... bad decade are now doing business: with caution abou... providing financing to buyers and with pared-down ... expectations in a world economy where the rules are ... constantly changing.

"The whole world is really very unstable now," Mr. Mestre said.

Venezuela, a shining example of economic growth just a few months ago, is now engulfed in political unrest and uncertainty. Even business rules change rapidly: Countries that once prohibited imports of used equipment now allow them. Mr. Mestre is wary that some rules could be reversed just as rapidly.

When Latin America was hot in the late 1970s, F.W. Mestre was selling fr... lion to $40 million in equipmer... With the onset of the Latin Am... crisis in 1982, heavy equipment s... meted. At F.W. Mestre, sales di... falling until they hit $300,000 i... 1980s.

Then last year, when the regio... mies picked up, sales rose to mo... million.

"The Latin American market i...

Mixed Signals ...sia Negotiations

...ch and every t and the ...each and every i, that isn't ... works."

...concern in the State De... ...hat the IMF has not al... ...into account the "politi... ...ocial context" of its ... State Department offi...

...al voiced hope that the ...take those issues into ...aling with Russia. ...ly, David Mulford, ...dersecretary, warned ...ng a "manufactured ... achieving a Russia... ...reement, such as the ...mit of the Group of 7 ...ons early next month ...many.

...said an agreement is ...sooner than better," ...ed the IMF nee... ...is "politically p...

...Mulford also sa... ...o get an agreer... ...uality" to estab... ...men if that requ... ...elieve.

...Treasury dep... ...hand-offs post... ...sia-IMF talks. "... ...ude in those ne...

...lso appeared ...

brush aside criticism from Russian representatives last week that the IMF was being overly stringent in its demands from Russia.

"I can't think of a country that hasn't said the IMF is too damn picky," he said. Mr. Robson stressed the need for Russia to reform its currency system and control its budget deficit and money supply.

An administration official, speaking on condition of anonymity, acknowledged it is "likely" that the State Department is taking a softer line than the Treasury regarding the IMF-Russian negotiations.

This official, who works neither at Treasury nor at State, denied the administration had shifted U.S. policy to pressure the IMF.

Industr... Falls S...

MOSCOW — Russ... output fell 13.2% in ... months of 1992, with t... ticularly marked in th... tor, Interfax news ... Monday.

Interfax, quoting figu... Russian statistics com... production in May was ... the same month last yea...

"The situation is mos... the oil and oil product in... production of steel pipes ... chemical filaments and c... materials," the agency ... volume of food produce... drilled continue to fall."

The statistics office a... lower output in part to t... down in business ties this ... in part to rising corporate ... ness, Interfax said.

Debts between Russian ... nies are put at well over ... rubles ($11.8 billion at the ... bank's market rate).

Russian First Deputy Prim... ister Vladimir Shumeiko sa... day President Boris Yelts... readying a new decree pro... new loans totaling 500 billion ... $5.9 billion) to bail out heav... debted firms.

The extra loans, if appr... would be used to pay off the ... looming debts, enabling firm... save off bankruptcy and mas...

...GY/COAL

...s Change ... Tax Plan

...ll. The full Senate ... draft compromise pl... ...nsider the revenue ... tremely fluid. ...

...sources following the ... Aides to Sen. ... ...id the plan Sen. Ford is ... Rockefeller decline... ...hich some refer to as the ... details of the dis... ...promise," would impose a ... the two senators. ...de tax on coal of 8 cents a ... The Rockefe... ...by the Financ... ...impose a tax ... ...hour on Eas... ...cents an ho...

... plan calls for a premium of ... It wou... ...ents of ton, however, for the ... largely ...dful of large-scale companies in ... state of ...e Bituminous Coal Operators Asso- ...tsen, ...iation whose contract with the ...mitt... United Mine Workers of America is ...rel... supposed to cover health care for ...in... retired union miners.

In addition, Sen. Ford's plan calls for a tax of 4 cents a ton on lignite, and proposes to transfer money from miners' pension funds or from a fund that is based on a tax currently collected to reclaim the nation's abandoned mine lands.

Some sources following the ... lation cautioned Monday that ...ations between Sen. Ford ... Rockefeller are ongoing.

...n Agrees to Join ...khstan Pipeline Ve...

...Chevron Corp. ... ...morandum of under- ...to join a joint venture pipe- ...sortium that would transport ...Kazakhstan to international ...kets. It was announced in Mus- ...Oman Monday.

The agreement also outlines the ...company's "desire to obtain priority ...access" to the pipeline for all crude ...oil that it plans to produce in the ...Korolev and Korolev fields of Ka- ...zakhstan, where it entered a joint ...venture development and produc- ...tion agreement with the ...republic last month. It signed ...

In addition ... from landlocke... ...ternational ma... ...so could serv... ...of Kazakhst... ...troleum to ... ...essing facu... ...the termen... ...Omar believe.

...50% ... ...which ... ...mer...

New Uses For Old Commodity Could Mean Big Win For U.S. Exports, But Quality is Still an Issue

Chances are there's something different about the newspaper you're reading. The layout may be the same; the editorial page probably carries the same columnists; and most of the wire stories still come from the Associated Press. The sale price went up a nickel? Perhaps. But it's what shows up — or doesn't show up — on your hands after you've finished reading that could have a major impact on the future of one of America's leading agricultural commodities.

It's the ink used on newsprint that is making headlines today. Since the early 1980's, the American Newspaper Publishers Association (ANPA) has been experimenting with printing ink made from soybean oil as a low-cost, environmentally safe alternative to petroleum-based inks. In lab tests ink, based on soy oil, has proven to penetrate the pigment of newsprint better than traditional petroleum-based inks, thus eliminating the messy rub-off that has always been associated with reading a newspaper.

ANPA's goal has been to provide the newspaper industry with a stably priced ink that is derived mainly from a renewable resource readily available in the United States. In 1985, the association offered a hybrid ink made from soybean oil, petroleum, and carbon black pigment. This ink, however, contained only about 30 percent soy oil and cost 70 percent more to produce than conventional inks. Today, however, researchers at the Agricultural Research Service's (ARS) National Center for Agricultural Utilization Research in Peoria, Illinois, have developed a variety of 100 percent soybean oil inks that are cheaper to produce, easier to reproduce, and more colorfast than the ANPA prototype.

Photo inset, opposite: Chemist Sevim Erhan, of the Agricultural Research Service's National Center for Agricultural Utilization Research in Peoria Illinois, tests trapping capabilities — the ability to print a wet ink film over previously printed ink — of her experimental soy inks on the "Little Joe" printing press.

The costliness of producing black and color soybean oil ink was overcome, says ARS chemist Sevim Erhan, by formulating a lighter color vehicle to reduce the amount of pigment used and by displacing a more expensive petroleum resin. This should lower the cost of 100 percent soybean ink by making it go further, she says. Additionally, Dr. Erhan says, the new ink is completely compatible with the newspaper printing presses now in use.

Ink for every use — from money to paper grocery bags to business forms- - requires a formula specifically developed for that use. The ARS formulations are easily adjustable to meet various needs. "The ink formulations we've developed have a wide range of viscosity and tackiness," Dr. Erhan says. This should be a boon for printers looking for a quality ink and an easier cleanup; such factors are important considerations for printers, each of whom has slightly different needs.

A possible wholesale conversion to soybean oil ink, both at home and overseas, has the people at the American Soybean Association understandably excited. According to ANPA, U.S. newspapers used more than 500 million pounds of ink in 1988. About 70 percent of that was petroleum-based ink that soy oil could replace. "The total potential, if all printers converted to 100 percent soy ink, could be about 100 million bushels" of soybeans, says Stu Ellis, director of Domestic Marketing Programs for the American Soybean Association. Currently, production of the ANPA soy-based ink uses 5 million - 10 million bushels of soybeans each year.

Increases in U.S. soybean exports could well be expected from a worldwide switch to soy-based ink, but another factor — quality control — profoundly affects overseas markets for U.S. soybeans. While soybeans from the United States are arriving in better condition these days at European and Asian ports, further improvements are needed, according to a recently completed study by ARS and the Federal Grain Inspection Service.

In commenting on the study's findings, Dr. Timothy L. Mounts, research leader for food quality and safety at ARS/Peoria, notes that soybean shipments from Paraguay, Argentina, and Brazil have historically contained lower levels of foreign matter than U.S. shipments.

"The degree of product damage and foreign matter contained in a soybean shipment determines the amount and quality of salad oil, cooking oil, and soy oil inks that can be refined from it," he says. These findings, he adds, may spur efforts to improve grain handling and general crop quality through breeding and genetic engineering. One step to improve crop quality and reduce refining losses is being taken by ARS chemist Gary R. List at the Peoria Center. He has identified the soy enzyme phospholipase D as the main culprit in oil refining losses, especially in beans handled roughly before reaching the processor. The enzyme may increase losses during oil refining from the normal 2 to 4 percent to 20 percent, depending mostly on how well the soybeans were handled before processing, he says.

Phospholipase D interferes with degumming, the first step in soybean refining. Degumming frees crude oils of phosphatides, including lecithins, gums, and other fat-like phosphorus-containing compounds. The enzyme allows some of these phosphatides and other compounds to escape removal during degumming and remain with the soy oil until further processing.

List hopes to use genetic engineering to pre-condition soybeans before shipment or just before oil extraction to minimize refining losses. Currently, he says, the only good way to stem the activity of phospholipase D is to handle the soybeans gently through the marketing process at the lowest practical moisture level. But beans that are too dry may split, yielding poor quality by making it more difficult to extract oil from them.

According to Dr. Mounts, biotechnology is the key to improving the quality of finished soybean oil by modifying oil composition and by eliminating phospholipase D in the bean. "We can strengthen the competitive advantage of U.S. soybeans by emphasizing our lower refining losses," he says.

Dr. Erhan and her associate at the Center for Agricultural Utilization, Dr. Marvin Bagby, have applied for a patent on the 100-percent soy oil ink and the process for making several formulas. The commercial application of this patent, along with a few biotechnological advances in soybean development and refining, could make "Made in USA" the label of choice as the world seeks to meet an increased demand for quality soybean products.

For more information contact:

Dr. Timothy L. Mounts
Food Quality & Safety
Research
National Center for
Agricultural Utilization Research
Agricultural Research Service
U.S. Dept. of Agriculture
Peoria, IL 61604
(309) 685-4011

Dr. Sevim Erhan
Oil Chemical Research Unit
National Center for Agricultural
Utilization Research
Agricultural Research Service
U.S. Dept. of Agriculture
Peoria, IL 61604
(309) 685-4011


Walton County Hospital
Monroe, Georgia
NURSING AREAS
IN
WALTON COUNTY
HOSPITAL
ON
EMERGENCY ROOM

Taking Charge of Rural Health: Community Wellness at Work

If you live in rural America, access to health care means more than just the ability to pay for medical services. Simply getting to a doctor or clinic is a problem for many residents of rural communities, particularly if they don't own a car. For these people, routine health care is difficult. For the seriously ill, it can be a matter of life or death.

In the past decade, economic contraction, shrinking populations, and a reduction in Federal and State assistance programs have made it difficult for rural communities to support full-service health care. The resulting concentration of health care in urban centers has left some rural communities without any health facility at all.

This is the case in Talbot County, Georgia. A small county with a population of 2,500, Talbot's only health service was a nurse practitioner located in the county health department. With the help of the county extension director, residents organized a Community Wellness Council. This council, made up of representatives from the county health department, school system, churches, and governmental agencies, identified isolation of the elderly as a major public health concern in the county.

The group agreed that transportation to health services was the most attainable solution to this problem. They applied for a State grant to provide 80 percent of the purchase and operating costs of a van; the county was to finance the remaining 20 percent. Since the county lacked the cash reserve to meet even this requirement, the council worked out an in-kind agreement with the State. Using volunteers, the county meets its obligation by providing drivers and maintenance for the van. Now, Talbot County can provide its elderly residents with regular van service to health care facilities.

Inset photo, opposite: Bringing nursing students and rural communities together to discuss employment opportunities is the primary focus of the Nurse Placement Fair.

Farm Safety Program teaches emergency medical technicians how to rescue farmers from farm machinery.

Community Wellness Councils like the one in Talbot County have begun to appear throughout Georgia. These councils operate on the premise that in an era of diminished Federal and State assistance, local solutions should be found for local problems.

Each council's development begins with a survey of area residents to determine their primary health concerns. The county extension agent, who serves as the initial coordinator of the council and its activities, ensures that the survey is distributed to a sample reflecting the county's demographic makeup.

The results are matched with vital statistical data to develop a county health profile. The council uses this profile to determine the projects it will pursue. Some of the issues other councils have tackled include responsible drinking, chemical-free teens, cardiovascular health, nutrition, and teen pregnancy.

In Lamar County, Georgia, the rural health care landscape appeared much the same as in Talbot. With no hospital, the county's only health services for the poor and elderly were provided by a small medical clinic operating on a sliding fee scale. For the more affluent, it often took more than a week to get an appointment with one of the county's two private physicians. Faced with a serious access problem and little health promotion activity, the county's Community Wellness Council decided to organize a health fair to bring health screenings to the people.

In 1989, the county extension service, chamber of commerce, and an area college sponsored their first biannual "Feeling Good" Health Fair. Public health and extension personnel and 200 volunteers provided between $200-$300 worth of health screenings to county residents at little or no charge.

Among the free offerings were blood pressure, vision, dental, and hearing tests; heart attack, height, weight, and nutrition assessments; and lifestyle and breast cancer consultations. For a small fee, a blood chemistry test and colo-rectal kit were offered. Health professionals and extension agents counseled participants on some test results and explained how to follow up on the others.

Of Lamar County's 1,300 residents, more than 400 attended this year's health fair. "For many of the elderly," explains former Lamar County Extension agent Karen Beeland, "this was the only health care they received. Many waited the two years between fairs to seek any kind of health or medical treatment."

Attending the health fair helped save Melvin Hamlin's life. The results of a colo-rectal test performed with a kit obtained at the health fair revealed the presence of colon cancer. In an interview with the Barnesville Herald-Gazette, Mr. Hamlin explained that a subsequent doctor's visit revealed a large tumor in his colon that soon would have become inoperable.

"He didn't realize anything was wrong" Melvin's wife Leila said in the same interview. "Had he not gone, in another year's time, it would have been different. He owes his life to it."

Community Wellness Councils and "Feeling Good" Health Fairs are outgrowths of a statewide Community Wellness program run by the Georgia Cooperative Extension Service. The program's founder is Susan Jenkins, a former public health nurse and now a rural sociologist at the University of Georgia. She says Community Wellness represents a significantly different approach to health care issues.

"Local citizens, businesses, and organizations, both health and non- health related, are forming partnerships to mobilize local resources to address complex community issues," she explains. "The health issues of the 1990's will not be solved by the medical profession alone." Questions of lifestyle and access — to nutrition information, prenatal care, and education — cloud health issues with social and economic components. Instead of a "proscribed, single-source approach," says Jenkins, Community Wellness brings together a variety of community stakeholders to tackle health care issues. Using the Cooperative Extension System as a major multiplier of education, information, and services, Community Wellness brings the community and health professionals together to help rural people help themselves.

"When I came into Extension," explains Jenkins, "I realized that in every rural community there were two wonderful resources [public health and extension professionals] that were not working together." For the past 10 years, however, collaborative projects and partnerships between these two groups and others have been forming at the county, regional, and State levels. Now, the medical community has come to rely on the Cooperative Extension System as a critical multiplier of health information.

Community Wellness trains non-health professionals, primarily county extension agents, to conduct basic health programs. Simple programs, such as stress reduction workshops, are designed for the extension agent to manage alone. More elaborate programs, such as health fairs, are managed with the cooperation of health professionals and community organizations.

The Physician Recruitment Program is sponsored by seven organizations, six of which are medical groups. In this program, the extension agent is a key player in matching these medical groups, and their associated physicians and services, with relevant community needs. Nurse and physician recruitment fairs are the primary means by which Community Wellness makes these important matches at the community level.

Lynn Fieldman, M.D., director of a 35-county Public Health District, underscores the importance of the Extension Service to these efforts. "The Extension Service is the main reason our community has such a successful Community Wellness Council," she says. "The extension agent was the guiding force in bringing diverse groups and individuals together to focus our efforts toward wellness programs for our community. This is not an easy task, for each agency has its own agenda, but the agent was able to bring 30 organizations to consensus on this year's community project."

Extension's success with the Physician Recruitment Program is a prime example of how the agency functions within Community Wellness. "The agent begins as an organizer and evolves into a facilitator and resource person," says Susan Jenkins. Eventually, as in the case of the Community Wellness Councils, groups involved with projects first organized by the extension agent become more sophisticated and begin to identify and manage community health concerns on their own. Over time, the role of the extension agent diminishes.

In 1990, Community Wellness was at work in 150 Georgia counties. The program provided roughly $7 million of in-kind health, education, and volunteer services to rural communities. The program's success has captured national attention. Community Wellness and its component programs are being adapted as a national model for community health programs by the Cooperative Extension Systems in five states. Twenty states have applied parts of Community Wellness, and five countries — Australia, Burkina Faso, Canada, Mali, and Sweden, — are implementing the program as well.

Other states are adapting the Community Wellness model to meet their own community health needs. The North Carolina Cooperative Extension Service and East Carolina University School of Medicine, for example, have joined forces to form the State's first agromedicine program, a statewide network of primary care physicians working with extension agents on farm-related safety and health issues.

Emergency medical technicians taking blood pressure at the Risko, heart attack risk assessment program.

Under the program, North Carolina State University agricultural researchers and extension specialists work with East Carolina University physicians to identify and address farmworker health problems associated with pesticide and heat illnesses, skin cancers, noise-induced hearing loss, birth defects, allergies, and farm accidents.

The agromedicine program taps into expertise and networks already developed through North Carolina Cooperative Extension's pesticide applicator training and certification, farm safety and toxicology programs.

As progress is made toward identifying solutions to the Nation's health care crisis, policy-makers will look for working models from which components of a new national strategy can be drawn. Community Wellness has become a proven technique to further substantiate the adage "an ounce of prevention is worth a pound of cure."

For more information contact:

Dr. Susan Jenkins
Institute of Community and
Area Development
University of Georgia
Athens, GA
(404) 542-3350

Jeanne M. Priester
National Program Leader
Home Economics and Human
Nutrition
Extension Service/USDA
Washington, DC 20250-0900
(202) 690-2920

Tough Plants and Dead Insects, Naturally

In 1989 Forbes reported the success of the San Diego agricultural biotechnology firm Mycogen in using genetic engineering to develop a substance that kills a variety of crop pests. Using the bacterium Bacillus thuringiensis (BT) as a mass-producing agent, Mycogen researchers inserted a gene that produces a protein toxin that is lethal to caterpillars. By killing the host bacteria and adding them to a solution, Mycogen created a natural pesticide that can be sprayed on plants just as chemical pesticides are. Unlike chemical pesticides, however, natural pesticides are nontoxic to humans and don't leave residues on produce — they wash right off.

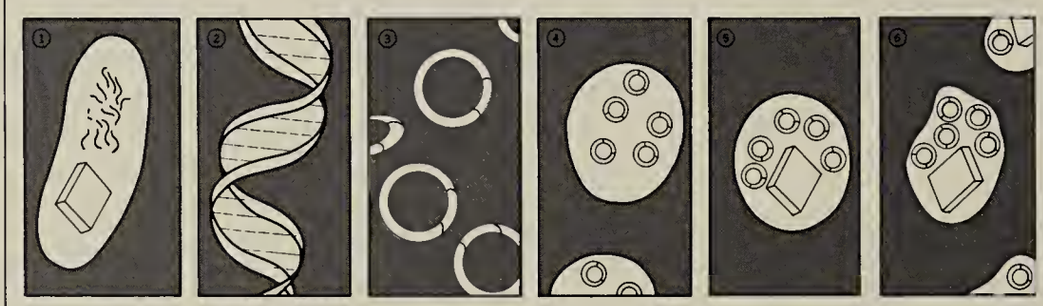
The development of MVP, as Mycogen calls its genetically engineered product, is a type of agricultural success story that often goes unheralded. In the popular press, agricultural biotechnology is more often than not reported in the context of its uncertainties. Pest management, however, is one area where great strides have been made recently in using biotechnology to dramatically improve the environmental compatibility of U.S. agriculture. Two particular areas of biotechnology research — biological controls and plant genetics — have produced results that could permanently change pest control practices the world over.

One method of biological control, the selective use of predators and parasites to attack crop pests, is not new to pest management. The advent of biotechnology, however, has dramatically increased the effectiveness of another method — the use of microorganisms such as toxins, viruses, protozoans, and fungi — to kill plant pests or otherwise disrupt their feeding or reproductive capabilities. "Recombinant DNA technology can provide the tools for safe, efficient, and cost competitive microbial biocontrol agents," says Dr. Robert R. Granados, director of the plant protection program at the Boyce Thompson Institute for Plant Research in Ithaca, New York.

Photo inset, opposite: Geneticist David Porter and entomologist Jim Webster, of the Agricultural Research Service's Plant Science Research Laboratory in Stillwater, Oklahoma, examine wheat seedlings infested with Russian wheat aphids.

Naturally derived insect-killing substances, such as BT toxins, have been used in pest control since the 1950s. Compared to chemicals, however, their effectiveness was hampered by their relative lack of potency, limited availability, and the higher costs associated with identifying, testing, and producing them. Time-consuming field searches and screenings were necessary to identify and test naturally occurring strains. With the ability to isolate and transfer genes, science can now alter the DNA makeup of microorganisms by inserting into them a foreign gene into them that increases their pesticidal activity.

In the past year, work done at Boyce Thompson has revealed new ways to insert these insecticidal protein genes into microorganisms such as BT, making them deadly or debilitating to crop pests. These altered organisms, called baculoviruses, are naturally occurring biotic agents that replicate in the target insect. Dr. Granados explains that the baculoviruses produce their pest-controlling proteins within the insect itself. The virus invades the insect through its midgut and begins to replicate. At this stage, the genes of the virus are expressed, or "turned on" in the insect's cells. If the protein is a toxin, it may immediately cause cell damage and kill the insect. If it is an enzyme, such as the juvenile hormone esterase, it may alter the development of the insect — perhaps causing it to stop feeding or reproducing. The key now is to quicken the pace at which these baculoviruses work. Some take four to 14 days to kill their target insects. "You have to get quick knockdown," says Dr. Granados. "That's what chemicals do. We're trying to move towards a faster acting biological control agent, because that's what the farmer needs."



© Forbes, October 16, 1989 *Robert Mansfield*

To kill a caterpillar

A natural pesticide starts with Bacillus thruningiensis, a wild bacterium (1) that produces a protein that eats away an insect's stomach. Find the gene that codes for the toxin (2), and insert it into a band of DNA called a plasmid (3). Inject the plasmid into fast-growing Pseudomonas fluorescens bacteria (4) and mass produce them in vats (5). Add chemicals to kill the bacteria, cure the mix, and you're ready to spray your crop (6).

Some initial successes have been reported. At the University of Georgia, research entomologist Dr. Lois Miller has isolated a baculovirus gene that, when deleted, increases the potency of the virus. The altered virus kills infected insects 20 percent faster than its nonengineered relatives. The gene, called EGT, encodes an enzyme that deactivates the insect hormone ecdysone, which controls molting. In this manner, the insect's growth is interrupted.

In his Delaware, Ohio, laboratory, U.S. Forest Service entomologist Dr. James Slavicek has succeeded in inserting a marker gene from the bacterium E. coli into a gypsy moth virus. This marker gene allows scientists to track a genetically engineered virus strain in field trials, testing its performance against that of a natural strain. Dr. Dick Smith, of the U.S. Forest Service's Forest Insect and Disease Research Branch, says this is the first step in developing a successful methodology to establish the safety, potency, and cost-effectiveness of a genetically engineered gypsy moth control agent.

Speed is not everything, however. BT toxins are faster acting than baculoviruses, but they require frequent application to be effective. This can be costly. Viruses, on the other hand, reproduce themselves in the field and thus can control pests throughout a growing season with only one application. This has been the case recently in Brazil, where a single baculovirus treatment controlled soybean caterpillar infestation in more than 1 million acres for an entire season.

Other considerations, such as host range and long-term immunities, also factor into the comparative advantages of BT toxins versus baculoviruses. Some viruses affect certain insects that BT toxins are not currently known to control. Areas of action are also different, with BT toxins affecting some parts of an insect and viruses affecting others.

According to Boyce Thompson's Granados, there already have been reports of insects displaying immunities to BT toxin sprays. "We have to be careful not to take the same unilateral approach that we did with chemicals," he asserts. "If we do the same thing with biologicals, we are going to have the same problems."

The answer to effective pest control for the future seems to lie in a combination of plant breeding, microbiological, and chemical processes that delay the development of resistance long enough for science to develop new breakthroughs. "Keeping the insect off balance — that's one of the keys here," concludes Dr. Granados.

Another continuously evolving area of pest management is plant genetics. It uses genetic engineering — which, simply put, is the transfer of genes from one living organism to another — to alter the genetic structure of plants. The goal is hardier crops of improved quality that withstand extreme weather conditions, insects, herbicides, or harmful bacteria or viruses.

The battle currently being waged against the Russian wheat aphid, responsible for more than $240 million in crop damage since 1986, provides a good illustration of plant genetics at work. The ARS laboratory in Stillwater, Oklahoma systematically tracks down aphid resistance. So far, scientists there have screened about one-fourth of the germplasm from the country's main genetic library, the National Small Grains Collection at Aberdeen, Idaho.

"We have found good resistance in common wheats," says ARS entomologist Robert L. Burton. "We're also exploring the possibility that wheat's relatives and ancestors might have aphid resistance that we could breed into wheat."

Dr. Burton says that Triticum tauschii (triticale) is one of the more promising relatives. Found in southern Russia, triticale displays an almost immune response to aphid feeding.

"It's a higher level of resistance than what we're working with right now," says Dr. David Porter, also of ARS/Stillwater. "The triticales appear to have some type of toxic property which acts on the aphid and disrupts its reproduction."

This bodes well for developing a long-term resistance to aphid infestation, the need for which is becoming more and more urgent. One of the few chemical insecticides that has proven effective in controlling the aphid is growing less so. "Parathion is probably one of the most toxic pesticides we have," explains Dr. Porter, "but I've seen reports of green bug types that are already resistant to this."

Herein lies the promise biotechnology holds for pest control, as well as the limitations of any control strategy. "The problem with aphids," Dr. Porter continues, "is that they are so fit reproductively and so adaptive that every time you do something to the plant, the aphid counterattacks. You may have significant control for a time, but you'd better have another resistant source or another gene ready to combat any adaptation the insect will eventually make. If you keep ahead of the game by breeding in new resistance, then you can safely say that you have controlled the insect."

So how are triticale's resistant properties appearing in wheat? Not easily, because of the different genetic makeup of the two species. Consequently, it will take longer to move the gene responsible for triticale's resistance into wheat varieties, Dr. Porter says. But the process scientists are following — finding a biochemical marker that signals insect resistance — reflects efforts to find faster ways to expose useful genetic properties for further study.

Currently, scientists must expose test plants to aphids to check their resistance. This takes time, sometimes more than a month, and may not produce the most precise results. Using biochemical markers, however, scientists can develop a screening assay, based on protein changes resulting from aphid attack, that quickly identifies the presence of resistant genes. ARS/Stillwater has reported significant success in testing biochemical markers in barley, and is now moving on to wheat varieties.

Conceivably, the future may hold in store a veritable menu of genes from which resistance to different pests can be selected. Imagine identifying a problem pest, selecting from a catalog a gene identified to breed resistance to that pest in certain plant species, then using that gene to transform the plant's cells and grow a plant that thrives in spite of the pest.

The missing link is in the last part of the process. According to Dr. Porter, "We don't yet have the system in place that will allow us to insert that gene into a wheat cell and then regenerate the plant routinely." Transgenic processes, as these are known, are the next items on several research agendas.

For more information contact:

Dr. Robert Granados
Plant Protection
Program
Boyce-Thompson Institute
Ithaca, NY 14853-1801
(607) 254-1234

Dr. David R. Porter
Plant Science Research
Laboratory
Agricultural Research Service
Stillwater, OK 74075
(405) 624-4212

Dr. Lois K. Miller
Director,
Department of Entomology
University of Georgia
Athens, GA 30602
(404) 542-2816

Satellite Courses Give Universities an Instructional Boost

At the State level, alternative educational delivery mechanisms like the mobile teaching laboratories used in Georgia and Kentucky make state-of- the-art learning possible in small rural towns. These laboratories help educators extend learning opportunities to many more people, even those in remote locations. But there is also a need for innovative mechanisms to extend expertise on a national scale. What about those University of Montana agricultural economics students who could really benefit from an international marketing course offered at Ohio State? Or the master's degree program in agricultural education at the University of Idaho that needs a specialization in sustainable agriculture? When courses are discontinued or expert faculty are unavailable, students may be left holding the bag on where to find electives that round out their majors.

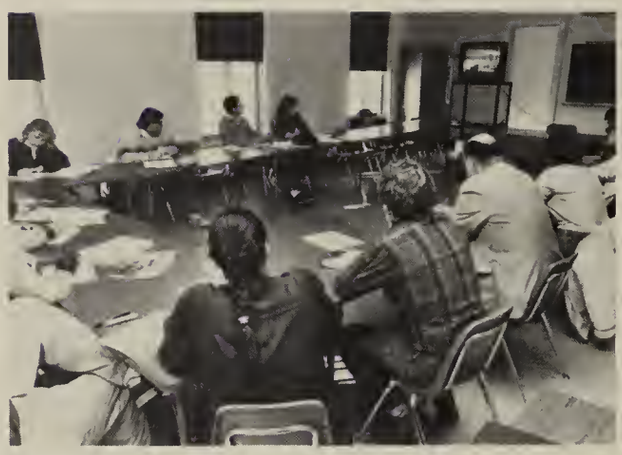
To meet this and other demands for higher education, 34 land-grant universities in 32 states formed the non-profit Agricultural Satellite Corporation (AG*SAT) in 1989. Organized as a collaborative effort of 1862 and 1890 land-grant institutions, AG*SAT is a national video network offering courses taught by the Nation's best instructors to students across the country. Funding comes from the universities themselves, and from matching grants received from the U.S. Departments of Commerce and Agriculture.

AG*SAT's institutional land-grant affiliates develop and distribute via satellite academic credit courses and Cooperative Extension programs. In crisis situations, the network can provide emergency programming to assist in coping with drought, floods, animal and plant disease epidemics, and other catastrophes. Additionally, the network is used to hold national conferences to share information on the latest research breakthroughs for use in other research programs and in the field.

In fall 1990, AG*SAT planned its first courses for a nationwide audience. One of them, "Introduction to Food Science", was a three-credit course teaching

---

The non-profit Agricultural Satellite Corporation (AG*SAT) offers students specialized courses in the food and agricultural sciences via satellite hook-ups at 34 land-grant universities in 32 states.



University of Nebraska-Lincoln students, along with future agriculturalists located at 12 other land-grant universities, are the first to be taught sustainable agriculture through the AG*SAT system. Here students watch as Dr. Ricardo Salvador, assistant professor in agronomy at Iowa State University in Ames, explains an agricultural concept.

the various aspects of converting agricultural commodities into foods. Offered the following spring by the Pennsylvania State University's Food Science Department, the course was telecast to 77 students in five States every Thursday evening from 6:30 - 9:15 p.m. (EST).

In Oregon, an industry group of product development and quality control specialists accessed the course from an in-house location. In Idaho, the course was beamed down to five county extension offices. Sophomore food science students tuned in to the course at the University of Idaho, the University of Nebraska, Tuskegee University, and three campuses of the Pennsylvania State University.

According to Dr. Lowell Satterlee, the course's instructor, AG*SAT allowed for a great deal of creativity in teaching, some of which could not be attempted in real life situations. A production technique called chromokeying enabled him to electronically walk into a videotaped demonstration to point out important parts of a food manufacturing process that in an actual situation would be dangerous or unsanitary, he says. "It's just like you see when the meteorologist on the evening news interacts with the changing weather maps," he says. The highly technical nature of the presentation, however, poses more challenges than the ordinary classroom lecture. AG*SAT lectures are not just delivered, Dr. Satterlee explains, they're produced. As a result, instructors must concern themselves not only with the content of their lectures, but also with presentation technique.

"As an instructor, you have to constantly keep in mind the sequence of the presentation. You can't ask the producer to back up if you miss something," Dr. Satterlee says. The instructor provides a detailed lecture outline so the producer can choreograph the various visual components.

While AG*SAT demands a somewhat scripted approach to course delivery, it does not preclude the valuable student interaction that characterizes the classroom environment. During the "show," students are linked to the instructor by telephone and can ask questions as freely as they would in a classroom setting. Each lecture concludes with the question and answer period typical of most college courses.

Testing is managed much the same way, with tests faxed to each downlink site and reproduced by an on-site coordinator. Using the phone bridge, as the

telephone hookup is called, Dr. Satterlee holds a question and answer period before each test. Fax machines are used to transmit completed tests to his office and to return test results to the students.

All around, those involved with this premiere AG*SAT course have been generally pleased. Student evaluations of the course were quite complimentary. "In 20 years of teaching experience," Dr. Satterlee remarks, "this has been my best semester."

Fueled by the network's initial success, AG*SAT's Resident Instruction Council (RIC) has planned an ambitious array of new offerings. Biotechnology techniques, improved teaching methods for faculty, animal breeding, waste management, water resource management, animal welfare, and agricultural sales and marketing are some of the college credit courses planned for delivery in fall 1991.

Randall Bretz, manager of AG*SAT programs and operations, said future courses will help supplement curricula and pool the expertise of instructors who are well-known in their fields, thus providing a variety of opportunities that might otherwise not be available to students in some agricultural degree programs. Additionally, he says, students can select from a wider range of course offerings and become exposed to agricultural problems and practices relating to crops and livestock not grown in their home States.

In fall 1990, AG*SAT also began carrying Cooperative Extension programs. Topics ranged from "Ways To Grow — Alternatives for Small Farmers" to "Impact of GATT and Free Trade Agreements on U.S. Agriculture."

Irv Omtvedt, vice chancellor of the University of Nebraska at Lincoln's Institute of Agriculture and Natural Resources, is chairman of the AG*SAT board. "Viewers can reap many benefits from this kind of extension programming," Omtvedt says. "Interstate discussion of common agricultural production problems, for instance, is possible on a timely and cost-effective basis. In agricultural emergencies, such as drought, expert advice can be given immediately, bypassing the time necessary to develop and distribute printed materials."

As more institutions and individuals use AG*SAT as an educational medium, the uses of the network are expected to grow. According to Jack McBride, AG*SAT's executive director, university- and industry-based agricultural research resources can potentially be combined across State lines to accelerate practical applications. Additionally, he says, international agricultural development can be fostered in areas such as Eastern Europe and Central America where improvements in agricultural technologies and practices could be realized through participation in AG*SAT programs.

For more information contact:

Dr. Lowell Satterlee
Department of Food Science
College of Agriculture
Pennsylvania State University
University Park, PA 16802
(814) 863-2950

Dr. Randall Bretz
Manager, Programs & Operations
AT*SAT
Nebraska Educational
Telecommunications Center
P.O. Box 83111
Lincoln, NE 68501
(402) 472-3611

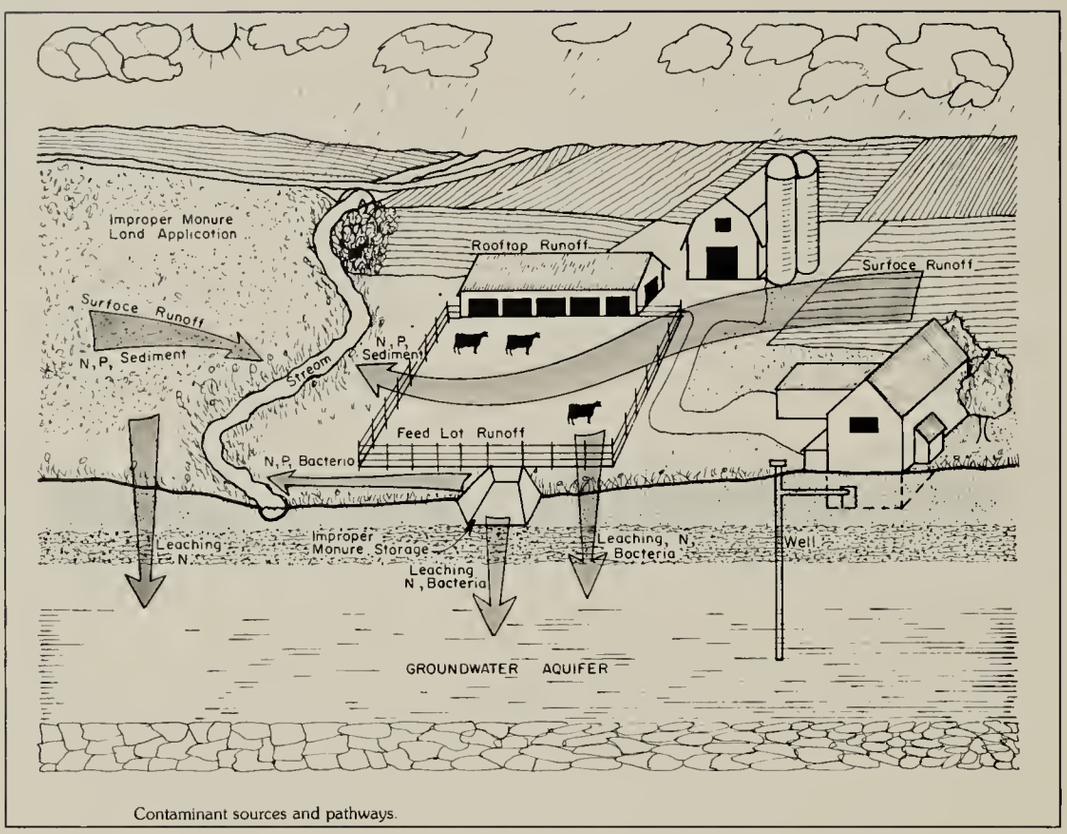
Helping Improve Water Quality and Farm Profitability

Increasing pollution levels in Maryland's scenic Monocacy River in recent years have raised concerns about the health of the river and its potential influence on the Chesapeake Bay. The Monocacy River winds south from Pennsylvania, through the rolling farmland of Maryland's Frederick and Carroll Counties to the Potomac River, and ultimately into the bay. High levels of nitrogen, phosphorus, sediment, and bacteria have become chronic problems throughout the Monocacy's 774-square mile watershed.

Fertilizers, animal wastes, and agrichemicals from 3,500 farms in the area, sewage treatment plants, and failing septic systems have been identified as the primary sources of these problems. Farming operations in the area produce over 1 million tons of manure each year and apply roughly 250,000 pounds of pesticides and other agrichemicals. In addition, it is calculated that half of the cropland in the watershed is eroding at accelerated rates, losing a total of 3.5 million tons of soil annually.

The problems faced in the Monocacy made it an ideal target site for the U.S. Department of Agriculture's 1990 National Water Quality Initiative. Three subbasins of the Monocacy watershed (Linganore, Piney/Alloway, and Israel Creeks) were selected as the core of an innovative five-year program called the Monocacy River Watershed Water Quality Demonstration Project. The project is one of only 16 such demonstration projects selected throughout the United States. The goal of the Monocacy project is to accelerate widespread, voluntary adoption of agricultural management practices that protect water quality while maintaining agricultural profitability. "All of us in the agricultural community are aware of the importance of protecting water quality," says Jeff Loser, Maryland's SCS State Resource Conservationist, "but farmers have to balance their desire to protect water quality with the economic realities of running a profitable operation."

A Farm Demonstration Tour underway at Maryland's Monocacy River Watershed Water Quality Demonstration Project. The tour's objective is to show area farmers how Best Management Practices (BMPs) to control runoff have been implemented on neighboring farms.



Contaminant sources and pathways.

The diagram above shows how farm runoff can contaminate surface and groundwater.

Today, a dedicated staff with an arsenal of educational programs, technical assistance, and innovative cost-sharing options have been assembled to help more than 450 farmers in the target areas battle agricultural pollutants and demonstrate winning strategies to their fellow farmers. The project is promoting a systematic approach to farm planning that includes such concepts as nutrient management, integrated pest management, conservation cropping systems, cover crops, erosion and sediment control, and agrichemical safety. The Monocacy project is a joint effort of the Soil Conservation Service (SCS), University of Maryland System Cooperative Extension Service (CES), and Agricultural Stabilization and Conservation Service (ASCS), in cooperation with the Frederick and Carroll County Soil Conservation Districts.

The Monocacy project is based on the premise that a local sense of ownership is vital to the project's success. For this reason the project is governed by an Executive Committee made up of respected farmers in the community who advise project staff and act as liaisons with the local agricultural community. In addition, the project reports to a 62 member steering committee that includes farmers, local agribusiness leaders, government agencies, and community interest groups. To implement the program, 42 farmers were recruited to set up demonstration areas.

"We try to have the farmers be a large part of what we're doing, because they're our best salesmen," says Richard Weismiller, Extension soil and water resource management specialist. "We want them to talk to their neighbors and persuade them that these methods really work."

This philosophy seems to be having the desired effect. For instance, cooperating farmer Chuck Fry implemented a farm nutrient management plan and recovered the cost of a new manure spreader in one year. He discovered that the nutrients in each load of manure were worth about $40. Fry also noted that applying manure according to soil test recommendations resulted in the best corn yields he's ever had. "I think it works better than the chemical fertilizers," he says, "because it doesn't release everything all at once."

Farm nutrient management plans measure soil fertility and account for applications of animal wastes or sewage sludge and the use of leguminous cover crops. These values are balanced against a farmer's planting projections for the coming year to calculate the amount of fertilizer that should be applied to each field.

In 1990, nutrient management plans were written for 60 farms in the Monocacy watershed area and saved producers an average of $22 per acre in fertilizer expenses. Nitrogen applications in the target areas were reduced by almost 200,000 pounds. Another Monocacy cooperator, Willard "Buzzy" Horton, a dairy farmer, was "sold" on building an animal waste storage facility. Storage facilities and waste lagoons were promoted by the project as a way to increase the efficiency of a livestock operation and reduce manure runoff into creeks or leaching of nutrients into ground water.

"My land is hilly," Buzzy says. "In the winter, it was an effort to scrape up the barn, put it in the spreader, and try to pull the spreader up those hills, rain, snow, shine, mud — whatever. I didn't have the room to stockpile it." Now, says Horton, he needs to spend only 20 minutes a day scraping manure into his storage facility, and he spends about two days every six months to pump out the facility and spread the manure on his fields.

Cost-sharing has become the key to the successful adoption of many of the project's structural practices, such as animal waste storage structures, roof runoff control systems, grassed waterways, and spring developments. James Richardson, ASCS state executive director, noted that the average construction costs for animal waste facilities range between $30,000 and $60,000.

"The cost-sharing program was developed to provide incentives to farmers to adopt new technologies," he said, "and offset costs where the market does not reimburse the farmer directly." In addition to existing State and Federal cost-sharing programs available throughout the State, ASCS has received more than $600,000 in special cost-sharing monies specifically targeted for Monocacy watershed farmers. Integrated Pest Management (IPM) is another major practice promoted by the project. Like nutrient management, it is a systems-oriented practice. IPM is designed to protect water quality and maintain economical crop yields by integrating pest monitoring with the use of resistant crops, crop rotations, and biological and chemical pesticides to control weeds, insects, and disease.

In the project's first year, 32 farmers enrolled 4,302 acres in the IPM program. Four scouts hired by the Monocacy project inspected the alfalfa, corn, or soybean fields enrolled in the program. They provided each farmer with a weekly report that identified emerging problems before they caused economically significant crop damage, and they advised the producers on the proper course of treatment. Scouting also provided producers with a sense of security about the condition of their crops, allowing them to comfortably forego unnecessary preventive pesticide applications.

While it is still too soon to determine the net effect of the project's conservation and management practices on water quality in the watershed, efforts to increase the types and frequency of water quality testing are underway. Several agencies are cooperating in the region to monitor progress made in improving water quality. The U.S. Geological Survey has included the Israel Creek sub-basin of the Monocacy watershed in a 20-year study of streams and ground water in the Potomac River Basin.

SCS has selected the Monocacy watershed as an evaluation site for its Water Quality Computer Model Evaluation Study. The study's purposes are to determine the technical reliability and efficacy of designated models and to determine their usability and utility. Two computer models are being studied. One allows the user to select a pesticide and soil type to determine leaching potential; the other evaluates agricultural management strategies, such as crop rotations, tillage operations, irrigation scheduling, and nutrient/pesticide application rates, for associated levels of nitrate, phosphorus, pesticides, and sediment.

Next year, the Monocacy project hopes to use funds from a pending CES grant to pursue a drinking water testing program. Demonstration projects would involve conducting pesticide assays of selected wellheads, explaining testing mechanisms and results, and recommending septic system and landscaping designs that protect wellheads from contamination.

For more information contact:

Thomas H. Miller
Monocacy Project Field Coordinator
Cooperative Extension Service
University of Maryland
College Park, MD 20742
(301) 898-0133

NAL Improves Database Services

The National Agricultural Library (NAL) has expanded its database offerings in a variety of areas, including some that are highly specialized. Among the most comprehensive of these efforts is the compilation of a World List of Agricultural Serials. NAL, in cooperation with CAB International, has compiled a database of agricultural serials consisting of more than 50,000 titles. NAL hopes to make the list available on CD-ROM, thus producing the largest listing of world agricultural periodicals in one publication.

As a service to floriculture, NAL, with support from the American Floral Endowment (AFE), is developing the American Floral Endowment database. This database provides an ongoing documentation and reporting system for AFE-sponsored research and education grants awarded since 1961. This information may be used in grants planning to avoid duplication, to evaluate past and future areas of industry interest, and to follow up on work in progress.

For more information contact:

Shirley Edwards
Indexing Branch
Natural Agricultural Library
(301) 344-3829

Idalia Acosta
Cataloging Branch
Natural Agricultural Library
(301) 344-4565

NAL Captures Farm History

The NAL has recently initiated two programs designed to allow video access to the recorded history of American agriculture. One project, the Alternative Farming Systems Information Center, has begun videotaping "oral histories" with farming authorities in an effort to save their expertise for future generations of U.S. farmers. The videotaped interviews will be maintained in NAL's files in hopes that the advice and knowledge of today's noted agricultural scientists will be of assistance to agriculturalists in the next century and beyond. Videotapes have been made with three scientists to date, and more are planned.

The food and agricultural sciences are the bridge between the Earth's natural resources and sustained human life. The health and well-being of America's citizens are inexorably linked to greater investments in this area.

Another project involves the development of a laser videodisc system that allows instant access to any of 50,000 items in the USDA's photography collection. Two videodiscs, each about the size of a long-playing phonograph record, contain black-and-white photographs, color slides, botanical illustrations, and television public service announcements. Computer software with a synonym-based thesaurus permits a researcher to view on a television screen all photographs on the discs related to a particular subject.

For more information contact:

Ronald Young
Special Collections Branch
National Agricultural Library
(301) 344-3876

Jayne MacLean/Jane Gates
Alternative Farming Systems
National Agricultural Library
(301) 344-3724

NAL Food and Nutrition Information Center Expands Services

Through an agreement with the USDA Food and Nutrition Service (FNS), the Food and Nutrition Information Center of NAL has expanded its services to include other Federal agencies, elementary and secondary schools, State departments of health and education, the Supplemental Food Program for Women, and food distribution programs on Indian reservations. The Center provides comprehensive reference/research assistance; lends copies of journal articles, other printed material, and audiovisuals; and offers on-site previews of software programs related to diet.

For more information contact:

Robyn Frank
Information Centers Branch
National Agricultural Library
(301) 344-5414

Attracting and Retaining Cultural Diversity in the Food and Agricultural Sciences

Many colleges and universities are working hard to attract and retain underrepresented minorities in food and agricultural science careers. One highly visible example is Project 2000, launched in 1989 by the American Home Economics Association. This national initiative is designed to recruit, retain, and graduate more minority students into college and university programs in home economics.

Among the organizations cooperating in the effort are the Coordinating Council of Home Economics Honor Societies, American Council on Education, Coalition for Black Development in Home Economics, National Council of Administrators of Home Economics, National Association of Extension Home Economists, Council of 1890 Home Economics Administrators, and the American Home Economics Association's Agency Member Unit (an organization of academic units offering undergraduate degree programs in Home Economics).

Additional efforts include the Junior Aggie Summer Research Apprenticeship Program (JASRAP) at the University of California-Davis; Andrews University's Genesis program, designed to recruit single parents — predominantly minority women; and the U.S. Forest Service's outreach program with Delaware State College, in which USFS employees teach forestry classes at the college in order to encourage minority students to pursue forestry careers.

For more information contact:

Dr. Taylor Johnston
Associate Dean
College of Agriculture and
Natural Resources
Michigan State University
(517) 355-0234

Dr. K. Jane Coulter
Deputy Administrator
Office of Higher Education
Programs
U.S. Dept. of Agriculture
(202) 720-7854

Understanding The Food and Agricultural Sciences

A strong science background is increasingly important for high school graduates entering agricultural careers. A general lack of appropriate curriculum materials deters most teachers from teaching agri-science in high school. To address this problem, several institutions have initiated projects aimed at making agricultural curricula easier to develop.

The North Carolina Department of Public Instruction, the North Carolina Biotechnology Center, and the College of Agriculture and Life Sciences at North Carolina State University conducted a five-day workshop during the summer of 1989. Twenty agriculture teachers were shown how to develop agri-science lesson plans involving higher order thinking skills.

The College of Agriculture, University of Wisconsin-Platteville, received a $95,000 grant from the National FFA Foundation to develop a complete agricultural marketing primer for high school agricultural institutions. The primer includes student activities, motivations, instructor outline, student text, and teaching materials.

For more information contact:

Dr. K. Jane Coulter
Deputy Administrator
Office of Higher Education Programs
U.S. Dept. of Agriculture
(202) 447-7854

Dr. James Oblinger
College of Agriculture and Life Sciences
North Carolina State University
(919) 515-2614

Cooperation = Environmental Protection

Within USDA, interagency cooperation on environmental protection programs is increasing and is yielding measurable results. This cooperation is also bringing Federal agencies into increasing contact with State and local efforts to sustain environmental quality. One area of significant cooperation carries out the Conservation Reserve Program (CRP) of the Food Security Act of 1985. In Alabama, compliance provisions are covered by Cooperative Extension through meetings, publications, the media; in Wisconsin, Extension and the Soil Conservation Service (SCS) have helped 82,000 farmers comply with the CRP and local land conservation requirements. In Iowa, more than 41,000 contacts were made in soil and water conservation programs conducted by Extension, SCS, the Farmers Home Administration (FHA), the Iowa Department of Natural

Resources, the Iowa Department of Agriculture and Land Stewardship, and local soil and water conservation districts. Approximately two-fifths of the farmers and producers reached through this effort have modified their production practices.

For more information contact:

Elbert Dickey
Department of Agricultural Engineering
University of Nebraska
(402) 472-1413

Ricardo E. Gomez
Plant & Pest Management Sciences
Extension Service
U.S. Department of Agriculture
(202) 720-2471

Internationalizing Food and Agricultural Curricula

As a result of a national report on internationalizing agricultural curricula by the year 2005, several universities have made notable progress in structuring curricula that prepare future graduates to better function in a global economy.

Oregon State University has instituted a minor for undergraduate and graduate students in International Agricultural Development. Required core courses include an international agriculture seminar, Technology Transfer, International Agricultural Development (economics), and International Extension Methods. Electives focus on providing students with the technical expertise needed for a particular international setting, as well as requirements for social, cultural and/or economic areas.

The School of Agriculture and Home Economics at Tuskegee University has required that all majors take World: Food, Fiber, and People during the freshman year. The course provides an orientation to food and fiber production systems throughout the world as they are influenced by people and culture. Comparative study of regions of the United States and selected countries in West Africa, East Africa, Europe, Russia, the Middle East, and Asia is featured.

For more information contact:

Dr. George Sledge
Associate Dean/Director
Academic Affairs
University of Wisconsin
(608) 262-3003

Dr. Julia Miller
Dean
College of Home Ecology
Michigan State University
(517) 355-7714

Faculty Development

The future of higher education depends on attracting quality students into quality educational programs. The enhancement of faculty capabilities is a wise investment, and innovative programs to promote this are underway at a number of universities. Two examples include:

The College of Agricultural and Life Sciences, University of Wisconsin-Madison, has produced a series of four video tapes on Coping with Academic Stress to benefit its faculty members.

The Division of Home Economics at Northwest Missouri State University has sponsored two faculty workshops — Writing Across the Curriculum and Teaching for Critical Thinking. These workshops have been funded through a larger Culture of Quality program on campus.

For more information contact:

Dr. Ted Hartung
Associate Vice Chancellor
Institute of Agriculture
and Natural Resources
University of Nebraska-Lincoln
(402) 472-7211

Small Farm Programs

Educational programs are assisting small-scale agriculture across the Nation. These programs enable farmers to assess resources and consider both traditional and alternative enterprises in production, management, and marketing systems that improve the stability and profitability of the farming unit. The Farm Opportunities Program in the southern region of the United States emphasizes planning and recordkeeping in one-to-one relationships with farmers and landowners. On-farm demonstrations show how income can be increased on small farms through alternative crops and with modern technology. Marketing strategies are developing new markets for specialty items and expanding existing markets.

For more information contact:

Dr. Harold Benson
Administrator-1890 Extension Programs
Kentucky State University
(502) 227-5933

Waste Management

Training and coordination are being provided to help local officials deal with the growing problem of solid waste management. Extension is providing leadership and facilitating citizen involvement in the formation of solid waste districts and other organizational arrangements that help municipalities manage their waste. In the Eastern United States, educational programs aimed at the public are focusing attention on composting and recycling. Programs for homeowners are promoting safe handling of household hazardous waste. Research programs are exploring the feasibility of applying municipal sludge to forest lands and the expanded use of composted materials in landscaping.

For more information contact:

Dr. Marvin Konyha
National Program Leader
Waste Management
Extension Service/USDA
(202) 224-4124

Rural Community Viability

Social science research is providing the basis for programs to ease the burden of adjustment to problems facing rural Americans and small towns. The farm crisis of the mid-1980's created social stress as families faced the loss of their farms, livelihood, social standing in the community, and sense of personal worth. Research results helped facilitate adjustment to these stresses and to others that arise as existing jobs disappear in rural America and new jobs are sought to replace them. This research provides the understanding of economics, local leadership, and community organization that is required to develop and effectively deliver programs that deal with these problems.

For more information contact:

Dr. Gerald E. Klonglan
Iowa State University
(515) 294-8311

Youth at Risk

Educational programs whose basic objectives are to help young people reach their full potential are aiding youth at risk in situations where they are not able to cope for themselves. In areas ranging from rural Arkansas to New York State to inner city Chicago, youth facing problems of adolescent pregnancy, substance abuse, and high school dropout are being assisted with programs that build positive self-concepts and develop decisionmaking skills. Other programs enable youth to develop special interests, carry out leadership assignments, and develop speaking skills. Minority and disadvantaged youth receive training in life skills and career education that is coupled with positive work experience.

For more information contact:

Dr. Jon Irby
National Initiative on Youth at Risk
Extension Service/USDA
(202) 447-3891

Elderly in Rural America

Research on the interests and needs of people 65 and older is facilitating community planning for services required by this rapidly expanding segment of the population in rural America. Communities must recognize the economic potential of population shifts and understand how such shifts affect the tax base. Management of personal resources during retirement and the links between resource management and life expectancy are being analyzed to improve economic viability and quality of life in later years.

For more information contact:

Dr. Jeanne Hogarth
College of Human Ecology
Cornell University
(607) 255-2238

Leadership Development

Extension staffs are using leadership development programs to increase the capacity of youth, adults, and communities to effectively organize and use resources. The Family Community Leadership (FCL) program, with support from the private sector, trains leaders in many states in leadership areas involving issue analysis and resolution, community affairs, public policy, and volunteerism. The Center for Governmental Technology in Mississippi provides continuing education and certification programs for mayors, county supervisors, and other local officials. Other programs train school district volunteers and develop educational modules for leaders at the lower end of the social and economic continuum.

For more information contact:

Jeanne M. Priester
Program Leader
Home Economics & Human Nutrition
Extension Service/USDA
(202) 447-2920

Management Tools For Applications in Agriculture

A new computer program called Planetor is designed to assist farmers in analyzing and planning their entire farm operation to achieve desired economic and environmental goals. The Planetor system identifies practices in the farmer's present operation that are potentially dangerous to the environment. It then provides guidance for making changes in production practices to eliminate or control the undesirable environmental affects. Then, the program analyzes the proposed changes for their potential impacts on profitability. Subsequent analyses can be run to attempt to optimize profitability while meeting environmental standards for the area where the farm is located.

For more information contact:

Dr. Richard Hawkins
Director
Center for Farm Financial Management
University of Minnesota
(612) 625-1964

Production of Lean Red Meat

A new low-fat ground beef formulation developed by the Alabama Experiment Station at Auburn University is being utilized by fast food restaurants and other large food service organizations and grocery firms. This product contains only 8 percent fat and has 40 to 50 percent fewer calories than traditional ground beef. Originally named AU Lean, this product is the basis for McLean Deluxe (Registered Trademark) low-fat hamburgers and has been adopted for use in Disneyland and Disney World.

For more information contact:

Dr. Dale J. Huffman
Department of Animal and
Dairy Science
Auburn University
(205) 844-4160

Enhanced Quality of Natural Fibers and Fabrics

Agricultural Research Service scientists have developed a computerized process control system that improves cotton quality. Enhancement of cotton quality is hampered by the variability of trash level and moisture content before processing at the gin. The machinery that is used to clean essentially all cotton degrades fiber quality and does not produce optimal monetary return to the farmer. To solve this problem, a computerized process control system developed by the Cotton Ginning Laboratory in Stoneville, Mississippi, measures fiber moisture and trash content before, during, and after gin cleaning and drying, and controls the flow of cotton through the optimal equipment sequence. This process can increase farmer profits by up to $40 per bale. The system has been installed in a small-scale gin, and field tests in a commercial gin are underway. A patent application was filed on this system in early Fiscal Year 1990.

For more information contact:

W. Stanley Anthony
USDA, ARS, MSA
(601) 686-2385

Ecological Management of Forests and Rangelands

Rangeland Research

Building on their own work and on the work of scientists at Pennsylvania State University and the University of Georgia, Forest Service scientists have devised a new approach to improving the poor condition of rangelands in the semi-arid Southwest. As in other areas with urban concentrations, Albuquerque has had difficulty disposing of municipal sludge. A single application of this sludge more than doubled yields of blue grama, the primary forage grass — and increased forage quality. Soil nutrients such as nitrogen, phosphorus, and potassium increased significantly; concentrations of heavy metals, an initial concern, did not increase. The Environmental Protection Agency is now evaluating this study, which was partially funded by the Bureau of Land Management.

For more information contact:

Robert Lewis
USDA Forest Service
(202) 205-0992

Forestry in Bottomlands and Riparian Zones

Across the country, research is producing management strategies to protect environmental values and to increase productivity at highly productive and diverse aquatic/terrestrial interfaces. Bottomlands in the South are some of the most potentially productive forest sites. Forestry research at the University of Tennessee is seeking to achieve balance among some of these competitive interests. In the West, riparian zones support much biodiversity and protect water quality. New silvicultural and management strategies being developed at the University of Washington and North Carolina State University seek to improve the production of forests in riparian zones while protecting other resource values.

For more information contact:

Dr. Russ Lea
Associate Dean
North Carolina State University
College of Forest Resources
(615) 737-2883

Dr. Ed Buckner
University of Tennessee
College of Forestry, Wildlife, and
Fisheries Science
(615) 974-0111

Dr. Bob Naiman
College of Forest Resources
University of Washington
(206) 543-2730

Wetlands Creation: Meeting the Challenge

Loss of wetlands is especially critical in the Southeast, where over half of the wetlands in the lower 48 states are located. Five southeastern states were among the top nine in the Nation in the rate of wetlands loss from the 1950's to the 1970's. Creation of urban areas, clearing land for agriculture, and intensive forestry all contribute to the problems, but it has been up to local universities to play a key role in offering solutions.

One such solution is being offered by the Forest Biology Research Center in the College of Forest Resources at North Carolina State University. The Center is coordinating multidisciplinary research in an effort to plan, supervise, and monitor constructed bottomland hardwood wetlands. These efforts utilize advanced computer-generated geographical information systems to accelerate the marriage of imaginative landscape design with engineered control and the most desirable biological conditions, taking much of the trial and error out of habitat construction. The systems approach also allows interested parties to see the proposed project without having a Ph.D. in everything from engineering to forestry.

For more information contact:

Dr. Russ Lea
Associate Dean
North Carolina State University
College of Forest Resources
(919) 737-2883

New Carrot Variety Helps Maintain Health

Carrots account for about 14 percent of the vitamin A in U.S. diets, due to a high content of beta carotene, which is a precursor of vitamin A. A new carrot variety rich in beta carotene was developed by ARS and is receiving high marks for flavor and for good growth in diverse geographical settings. More than 6,000 seed samples of this new variety, known as Beta III, have been sent to home gardeners in the United States, and 200 samples have been sent to 30 other countries.

For more information contact:

Dr. Philip Simon
USDA/ARS, Department of Agronomy
and Horticulture
University of Wisconsin
(608) 262-1248

Effects of Drugs on Chromium Status

Americans spend billions of dollars per year on over-the-counter medications, and little is known about the effects of these drugs on micronutrient bioavailability. Effects of five over-the-counter drugs on absorption of chromium were tested by Oklahoma State University researchers in a short-term study using rats. Aspirin increased the absorption of chromium, while antacids inhibited chromium absorption. Because chromium is an essential nutrient, effects of long-term use of over-the-counter drugs need further evaluation.

For more information contact:

Dr. Barbara Stoecker
Department of Food, Nutrition,
and Institution Administration
Oklahoma State University
(405) 744-8289

Evaluation of Frozen Meals For Home Delivery to the Elderly

Elderly persons living in rural areas usually have not had access to home delivery meal programs. Problems include the high cost of transporting meals daily, difficulty in obtaining volunteer drivers, and the inability of most delivery systems to maintain safe food temperatures during a lengthy delivery time. Researchers in Kansas explored alternative methods for expanding home delivery of meals to rural elderly recipients. The results suggest that commercial frozen meals are an acceptable option in providing safe, nutritious meals.

For more information contact:

Dr. Mary B. Gregoire
Dept. of Hotel, Restaurant,
Institution Mgmt., and Dietetics
Kansas State University
(913) 532-6011

Livestock, Poultry, and Fish Diseases

Continual efforts are being made to prevent the threat of diseases present in foreign livestock from entering the United States and causing serious problems. Disease agents of primary concern include influenza viruses that affect a variety of species, including humans; bluetongue virus; the virus that is involved in bovine spongiform encephalopathy; and the African swine fever agent. Funds from the P.L. 480 program are being used to support research in other countries on some of these agents, especially the isolation and characterization of the type A influenza virus. Mapping of bluetongue virus occurrence in the Caribbean area is also being done. Much of this effort is coordinated through the Office of International Cooperation and Development.

For more information contact:

Dr. Calvina Dupre
OICD/USDA
(202) 653-7511

Global Change

Global change is an inclusive term used to indicate those changes to the earth's climate and environment that are largely caused by the activities of mankind — anthropogenic changes. For several years, research has been conducted on the effects of atmospheric deposition, or acid rain, on forest soils, streams, and lakes. Research in New Hampshire, Pennsylvania, and North Carolina has identified acid rain-related processes that affect soil nutrient cycling and variation in stream chemistry over time. Minnesota, Wisconsin, and Michigan researchers have identified how these processes affect lakes. From a large amount of research, it has become clear that sulfur and nitrogen compounds can cause shifts in water chemistry that result in the mobilization of nutrients and heavy metal ions. These chemicals are then free to flow with surface waters, causing changes in soils, streams, and lakes that are harmful to many forms of life.

For more information contact:

Robert Lewis
Forest Service Research
(202) 205-0992

Ozone has been studied in relation to slash pine growth in north Florida, singly and in combination with acid rain. During this three-year experiment, effects on the four slash pine families appeared to be cumulative. Significantly, of the four families studied, one was found to be tolerant, one sensitive, and two intermediate in response to air pollution. Ozone appeared to be affecting some growth processes at ambient levels, indicating that further increases in ozone could decrease growth of existing forests by 5 to 10 percent.

For more information contact:

C. P. P. "Pat" Reid
University of Florida
(904) 392-1850

A herbicide concentration sampling study is looking at 86 sample sites of the 200-hundred site interregional Project 7 (National Atmospheric Deposition Program) network. This effort has found that more than 50 percent of the surface water samples contained detectable levels of the herbicides atrazine, alachlor, metolachlor, and a degradation product of atrazine. Rain samples showed herbi-

cide concentrations of no greater than one part per billion. This level is only one-third of the proposed EPA drinking-water health advisory level for atrazine. More significant is the indication by these data that airborne transport may be an important route for the migration of agricultural chemicals into surface and groundwater.

For more information contact:

John M. Barnes
CSRS/USDA
(202) 401-5741

Animal Genetics and Biotechnology

Highly accurate selection methods have been developed to identify dairy bulls that transmit to their daughters a genetically superior makeup for milk production. These methods are widely used, but they involve costly and time-consuming progeny testing. Using gene mapping techniques, researchers are improving the process by providing genetic markers for this important trait. Researchers at the University of Wisconsin have developed a genetic marker associated with milk production that can be used along with pedigree information to predict the breeding values of replacement heifers and to screen young bulls for progeny testing.

For more information contact:

Dr. Neal A. Jorgensen
Wisconsin Agricultural Experiment Station
(608) 262-2397

The techniques for embryo transfer have undergone dramatic improvements in recent years due to university research programs nationwide. This has stimulated the commercialization of this technology. Scientists at Louisiana State University and Colorado State University have perfected microsurgical methods to split viable embryos of cattle, swine, sheep, goats, and horses and produce two or more genetically identical offspring. These techniques will be useful in developing special research animals and in increasing offspring from genetically superior females.

For more information contact:

Dr. W. H. Brown
Agricultural Experiment Station
Louisiana State University
Baton Rouge, Louisiana
(504) 388-4182

The control of the sex of offspring in farm animal breeding programs has been an unattainable goal of livestock producers for years. Recent studies by ARS investigators have achieved considerable success in separating X and Y chromosome-bearing sperm of the rabbit and pig. While these techniques are laborious, and are useful only in research at present, they represent a breakthrough in predetermining sex and have been validated by the birth of live offspring.

For more information contact:

Dr. Roger Gerrits
ARS/BARC/USDA
(301) 344-3066

Consortium to Strengthen Veterinary Medical Education

More than $2 million of proposals from individual veterinary colleges have been funded through the Pew National Veterinary Education Program. The largest single grant ($600,000) was given to seven universities in a Food Animal Production Medicine consortium. The consortium, led by the University of Illinois, is giving primary attention to developing methods for interchange of faculty and students, developing new and innovative curricular systems, and fostering research on changes in animal production that relate to environmental, animal welfare, and food safety concerns. An important aspect of this program is the effort to initiate and maintain a dialogue with Colleges of Agriculture. Other major awards went to a consortium focused on aquatic pathobiology and to a Center for Animals at Tufts University. Several small grants to other institutions will foster adjustments in college programs to keep pace with rapid changes in science, medicine, and animal health care delivery.

For more information contact:

Dr. Billy E. Hooper
Executive Director
Association of American
Veterinary Medical Colleges
(202) 371-9195

Members of the Joint Council on Food and Agricultural Sciences

Land Grant Institutions

Administrative Heads of Agriculture

Dr. H. Rouse Caffey (Cochair)*
Chancellor Louisiana State University
Agricultural Center
Baton Rouge, Louisiana 70894-5203

Extension

Dr. Craig S. Oliver
Vice President for Extension and
Director, Coop. Extension Service
University of Maryland
College Park, Maryland 20742

Dr. Ayse C. Somersan
Dean, Cooperative Extension
University of Wisconsin
Madison, Wisconsin 53706

Academic Programs

Dr. John P.H. Brand
Associate Dean, College of
Agriculture & Natural Sciences
University of Connecticut
Storrs, Connecticut 06269-4090

Dr. James L. Oblinger*
Associate Dean
College of Agriculture & Life Sciences
North Carolina State University
Raleigh, North Carolina 27695-7601

Research

Dr. Clive W. Donoho
Director, Georgia Agricultural
Experiment Station
University of Georgia
Athens, Georgia 30602

Dr. C. Colin Kaltenbach
Associate Dean
College of Agriculture
University of Arizona
Tucson, Arizona 85721

Forestry

Dr. Arnett C. Mace Dean,
School of Forest Resources
University of Georgia
Athens, Georgia 30602

Veterinary Medicine

Dr. Robert D. Phemister*
Dean, College of Veterinary Medicine
Cornell University
Ithaca, New York 14853-6401

1890 Research

Dr. Bobby R. Phills
Dean, College of Agriculture
and Home Economics
Southern University
Baton Rouge, Louisiana 70813

1890 Extension

Dr. Fred Harrison*
Administrator and Director
School of Agriculture,
Home Economics, and Allied
Programs
Fort Valley State College
Fort Valley, Georgia 31030

Home Economics

Vacancy*

*Executive Committee

AASCU/AASCARR Institutions

Dr. W. Anson Elliott
Head, Department of Agriculture
Southwest Missouri State University
Springfield, Missouri 65804-0094

Dr. Douglas M. Treadway
Chancellor
North Dakota University System
Bismarck, North Dakota 58505-0154

Office of Science and Technology Policy

Vacancy

Foundations

Vacancy

Producers

Mr. Robert B. Delano
Route 3, Box 1955
Warsaw, Virginia 22572

Industry

Dr. Gilbert A. Leveille*
Vice President, Research
and Technology
Nabisco Biscuit Company
East Hanover, New Jersey 07936-1944

U.S. Department of Agriculture

Science and Education:

Dr. Harry C. Mussman (Co-chair)*
Acting Assistant Secretary
Science and Education
U.S. Department of Agriculture
Washington, D.C. 20250

Agricultural Research Service

Dr. R. Dean Plowman
Administrator
Agricultural Research Service
U.S. Department of Agriculture
Washington, D.C. 20250

National Agricultural Library

Mr. Joseph H. Howard
Director,
National Agricultural Library
U.S. Department of Agriculture
Beltsville, Maryland 20705

Forest Service

Dr. Jerry A. Sesco
Deputy Chief for Research
Forest Service
U.S. Department of Agriculture
Washington, D.C. 20090-6090

Economic Research Service

Dr. John E. Lee
Administrator
Economic Research Service
U.S. Department of Agriculture
Washington, D.C. 20005-4788

Extension Service

Dr. Myron D. Johnsrud
Administrator, Extension Service
U.S. Department of Agriculture
Washington, D.C. 20250-0900

Cooperative State Research Service

Dr. John Patrick Jordan
Administrator, Cooperative
State Research Service
U.S. Department of Agriculture
Washington, D.C. 20250-2200

Higher Education Programs:

Dr. K. Jane Coulter
Director, Higher Eduction Programs
U.S. Department of Agriculture/CSRS
Washington, D.C. 20250-2200

Office of International Cooperation and Development

Dr. Duane Acker
Administrator,
Office of International Cooperation
and Development
U.S. Department of Agriculture
Washington, D.C. 20250

Soil Conservation Service:

Mr. William J. Richards
Chief, Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20250

Liaison from Other Groups

Board on International Food and Agricultural Development
Mr. Wales H. Madden, Jr.
President, BIFAD
712 West 9th Avenue
Amarillo, Texas 79107

National Agricultural Research and Extension Users Advisory Board
Mr. Turner Arant
UAB Liaison
Box 1, RFD
Sunflower, Mississippi 38778

Council for Agricultural Research, Extension, and Teaching
Dr. Elizabeth Hamlin
CARET Liaison
33450 SE Peoria Road
Corvallis, Oregon 97333

National Committees and Regional Councils of the Joint Council

National Agricultural Research Committee

Dr. Neville P. Clarke
Executive Director
Southern Assn. of Agricultural Experiment Directors
Texas Agricultural Experiment Station
Texas A&M University System
College Station, Texas 77843-2147

National Extension Committee

Ms. Barbara Cowdery
Chair, NEC
32 Hartford Terrace
New Hartford, New York 13413

National Higher Education Committee

Dr. Virginia Caples
Associate Dean, Home Economics
Alabama A&M University
Normal, Alabama 35762

Northeast Regional Council

Dr. Bud C. Tennant
Professor and Chief of Medicine
Department of Clinical Sciences
New York State College of Veterinary Medicine
Cornell University
Ithaca, New York 14853-6401

Western Regional Council

Mr. Thomas K. Schwartz
Executive Vice President
Beet Sugar Development Foundation
90 Madison Street #208
Denver, Colorado 80206

Joint Council on Food and Agricultural Sciences

Dr. Mark R. Bailey
Executive Secretary
Joint Council, CSRS
U.S. Department of Agriculture
Washington, D.C. 20250-2200